

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently amended) A computer implemented method for planarizing a semiconductor substrate, comprising:

tracking a voltage signal from an eddy current sensor corresponding to a thickness of a conductive film disposed on the semiconductor substrate;

calculating a second derivative from data representing the tracked voltage signal; and

identifying onset of planarization based upon a decrease in a value over time being monitored through the second derivative, the decrease occurring after an increase in the value.

2. (currently amended) The method of claim 1, wherein the method operation of tracking a voltage signal corresponding to a thickness of a film disposed on the semiconductor substrate includes,

detecting the signal from a probe that provides a linear response to a remaining amount of the conductive film.

3. (Original) The method of claim 2, wherein the probe is an eddy current sensor and the conductive film is a copper film.

4. (previously presented) The method of claim 1, wherein the method operation of calculating a second derivative from data representing the tracked voltage signal includes,

determining a second rate of change of a first rate of change, the first rate of change representing a slope associated with the tracked signal.

5. (previously presented) The method of claim 1, wherein the method operation of identifying onset of planarization includes,

establishing a threshold signal level through which the decrease in the value must fall below.

6. (previously presented) The method of claim 1, wherein the method operation of identifying onset of planarization includes,

establishing a drop level for the value of the second derivative; and

monitoring the value of the second derivative; and

once the value of the second derivative crosses the drop level, the method includes,

adjusting planarization parameters associated with the planarizing operation.

7. (Original) The method of claim 1, further comprising:

initiating a chemical mechanical planarization (CMP) operation under a first set of planarization parameters; and

adjusting the CMP operation with a second set of planarization parameters after the onset of planarization.

8. (Original) The method of claim 7, wherein the method operation of adjusting the CMP operation with a second set of planarization parameters after the onset of planarization includes,

decreasing both a down force applied to the semiconductor substrate and belt speed.

9. (Original) The method of claim 7, the first set of planarization parameters include a first slurry composition and the second set of planarization parameters includes a second slurry, the second slurry being less abrasive than the first slurry.

10. (previously presented) A method for determining when a substantially flat surface of a metal film has been achieved during a chemical mechanical planarization (CMP) operation, comprising:

monitoring a voltage signal corresponding to an amount of metal within a detection region;

determining a rate of change over time of a removal rate;

establishing a threshold decrease associated with the rate of change; and

triggering a transition point when the rate of change crosses the threshold decrease associated with the rate of change and after a period of time in which the rate of change increases, the transition point indicating an onset of planarization.

11. (Original) The method of claim 10, wherein the signal responds linearly to a change of an amount of metal within the detection region.

12. (currently amended) The method of claim 10, wherein the method operation of determining a rate of change over time of a removal rate includes, converting the voltage signal to a second derivative value of the voltage signal; and tracking the second derivative value of the voltage signal over time.

13. (Original) The method of claim 10, wherein in response to the method operation of triggering a transition point when the rate of change crosses the threshold decrease in the rate of change the method includes, adjusting processing parameters associated with the CMP operation.

14. (Original) The method of claim 13, wherein the processing parameters include one of a belt speed and a down force pressure applied to a substrate being processed.

15. (Original) The method of claim 10, wherein in response to the method operation of triggering a transition point when the rate of change crosses the threshold decrease in the rate of change the method includes, stopping the CMP operation; and changing a current polishing pad to a softer polishing pad.

16. (Original) The method of claim 15, further comprising: replacing a current slurry with a less abrasive slurry.

Claims 17-20 (Cancelled)